at least one electrode coupled to the measurement mass, wherein the at least one electrode is patterned to reduce stiction during sensor operation.

14 ~~2.~~ 13 The apparatus of claim ~~1~~, wherein the environmental condition is acceleration.

15 ~~3.~~ 13 The apparatus of claim ~~1~~, wherein the at least one cap wafer further comprises a top cap wafer and a bottom cap wafer that form a cavity, the measurement mass being housed at least partially within the cavity.

A1 cont'd

16 ~~4.~~ 15 The apparatus of claim ~~3~~, wherein the measurement mass further includes a passage for venting air from the cavity in the housing.

17 ~~5.~~ 15 The apparatus of claim ~~3~~, wherein the passage comprises an approximately V-shaped groove in the measurement mass.

18 ~~6.~~ 13 The apparatus of claim ~~1~~, wherein the electrode pattern includes one or more cavities for reducing stiction between the plurality of bumpers and the at least one electrode.

19 ~~7.~~ 13 The apparatus of claim ~~1~~, wherein the electrode pattern includes one or more reduced-thickness recesses for reducing stiction between the plurality of bumpers and the at least one electrode

20 ~~8.~~ 13 The apparatus of claim ~~1~~, wherein the electrode pattern is selected from a group consisting of

i) a plurality of squares;
ii) a plurality of circles;
iii) a plurality of concentric circles;
iv) a plurality of rectangles; and
v) a series of geometrically arranged pie-shaped segments.

21 9. The apparatus of claim 16, wherein the first plurality of bumpers is arranged in the shape of circles and ridges; and wherein the second plurality of bumpers is arranged in at least the shape of circles and ridges.

22 10. A method of fabricating a sensor element, comprising:

fabricating a measurement mass for detecting acceleration using a first process, the measurement mass including:

a mass housing having a cavity, and a spring mass assembly positioned within the cavity;

fabricating a top cap wafer using the first process;

fabricating a bottom cap wafer using the first process;

bonding the top cap wafer to a side of the measurement mass using a bonding process;

bonding the bottom cap wafer to another side of the measurement mass using the bonding process; and

making one or more dicing cuts at predetermined locations on the sensor element.

A1 Cont'd

23 11. The method of claim 22, wherein fabricating the measurement mass further includes fabricating a passage for venting air from the cavity.

24 12. The method of claim 23, wherein the passage comprises a V-shaped groove.

25 13. The method of claim 23, wherein the dicing cuts penetrate through the top cap wafer, the bottom cap wafer, and at least partially through the measurement mass.

26 14. The method of claim 25 further comprising a second process to expose the passage within the measurement mass; wherein air is removed from the cavity through the passage to create a low pressure environment in the cavity; and wherein the passage is sealed to maintain the low pressure environment within the cavity.

27 15. The method of claim 23, further comprising packaging the sensor element in a sensor housing and using a vacuum process to remove substantially all air from the sensor housing during packaging to create a low pressure environment within the sensor housing; wherein air is removed

from the accelerometer though the passage during the vacuum process; and wherein the sensor housing is sealed to maintain the low pressure environment.

28 ~~16~~. The method of claim 22 ~~10~~, wherein the top cap wafer includes a balanced metal pattern on an upper surface of the top cap wafer.

29 ~~17~~. The method of claim 22 ~~10~~, wherein the bottom cap wafer includes a balanced metal pattern on a lower surface of the bottom cap wafer.

A' cont'd 30 ~~18~~. The method of claim ~~10~~, wherein the spring mass assembly comprises springs; and wherein the springs include an etch stop layer on one or more surfaces of the springs.

31 ~~19~~. The method of claim ~~10~~, wherein the measurement mass includes one or more mass contact pads; and wherein the dicing cut is made through the top cap wafer to expose the mass contact pads on the measurement mass.

32 ~~20~~. The method of claim 22 ~~10~~, wherein the top cap wafer includes an electrode located on a lower surface of the top cap wafer; wherein the electrode includes one or more electrical leads; and wherein the dicing cuts isolate the electrical leads.

33 ~~21~~. The method of claim 22 ~~10~~, wherein the measurement mass includes one or more mass contact pads; and wherein the dicing cut is made through the bottom cap wafer to expose the mass contact pad on the measurement mass.

34 ~~22~~. The method of claim 22 ~~10~~, wherein the bottom cap wafer includes an electrode located on an upper surface of the bottom cap wafer; wherein the electrode includes one or more electrical leads; and wherein the dicing cuts isolate the electrical leads.

~~23~~ 35. The method of claim ~~10~~ 22, wherein the measurement mass includes one or more mass contact pads and the dicing cuts are made:
through the top cap wafer to expose the mass contact pads on the measurement mass; and
through the bottom cap wafer to expose the mass contact pads on the measurement mass.

~~24~~ 36. The method of claim ~~10~~ 22, wherein the dicing cuts are made through the top cap wafer and the bottom cap wafer and into the measurement mass, stopping at a predetermined distance from the passage within the measurement mass.

~~25~~ 37. The method of claim ~~24~~ 36, wherein the top cap wafer, the bottom cap wafer, and the measurement mass include electrodes; wherein the electrodes include one or more electrical leads; and wherein the dicing cuts isolate the electrical leads.

Respectfully submitted,

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